AMENDMENT TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of claims

1. (Previously Presented) A method for the preparation of a modified carrier for a catalyst to be used for the vapor phase epoxidation of alkene, comprising:

a) impregnating a preformed alpha-alumina carrier, which has been subjected to calcining and, optionally, other preforming treatments, as part of the preforming process, with at least one modifier selected from among alkali metal silicates and alkaline earth metal silicates;

b) drying said impregnated carrier; and

c) calcining said dried carrier.

2. (Original) The method of claim 1, wherein said modifier is selected from a group consisting of sodium silicates, lithium silicates and potassium silicates or mixtures thereof.

3. (Original) The method of claim 1, wherein said modifier is a sodium silicate with stoichiometry, Na2O-2.6SiO2.

4. (Original) The method of claim 1, wherein said drying is carried out at a temperature not exceeding about 250 degrees C. for at least the first two hours following said impregnation.

5. (Previously Presented) A method for the preparation of a catalyst to be used for the vapor phase epoxidation of alkene, comprising:

a) impregnating a preformed alpha-alumina carrier, which has been subjected to calcining and, optionally, other preforming treatments, as part of the

preforming process, with at least one modifier selected from among alkali metal silicates and alkaline metal earth silicates;

b) drying said impregnated carrier;

c) calcining said dried carrier; and

d) depositing silver catalytic material on said dried carrier.

6. (Original) The method of claim 5 wherein at least one efficiency enhancing promoter is deposited on said preformed alpha-alumina.

7. (Original) The method of claim 6 wherein said efficiency enhancing promoter is selected from a group consisting of at least one alkali metal, alkaline earth metal or oxyanion of an element, other than oxygen, having an atomic number of 5 to 83 and being selected from groups 3b through 7b and 3a through 7a of the Periodic Table.

8. (Original) The method of claim 6 wherein the said efficiency enhancing promoter is a salt of a member of a redox-half reaction pair.

9. (Original) The method of claim 6 wherein said efficiency enhancing promoter is a rhenium component.

10. (Original) The method of claim 1 or 5 where in said alkene is ethylene.

11. (Previously Presented) A modified carrier for a catalyst to be used for the vapor phase epoxidation of alkene prepared by a method comprising:

a) impregnating a preformed alpha-alumina carrier, which has been subjected to calcining and, optionally, other preforming treatments, as part of the preforming process, with at least one modifier selected from among alkali metal silicates and alkaline earth metal silicates;

b) drying said impregnated carrier; and

c) calcining said dried carrier.

12. (Previously Presented) A novel catalyst to be used for the vapor phase epoxidation of alkene prepared by a method comprising:

a) impregnating a preformed alpha-alumina carrier, which has been subjected to calcining and, optionally, other preforming treatments, as part of the preforming process, with at least one modifier selected from among alkali metal silicates and alkaline earth metal silicates;

b) drying said impregnated carrier;

c) calcining said dried carrier; and

d) depositing silver catalytic material on said dried carrier.

13. (Original) The method of claim 1 wherein the preformed alpha-alumina carrier comprises a platelet/fluoride-containing type alumina having at least 95% by weight alpha-alumina, a unique interlocking platelet morphology, and a surface area of at least about 0.5 m2/g, a pore volume of at least about 0.5 cc/g, and a median pore diameter between about 1 to 25 microns.

14. (Original) The method of claim 13 wherein the modifier is a sodium silicate with stoichiometry, Na2O-2.6SiO2.

15. (Original) The method of claim 1 or 13 wherein said modified carrier is washed after calcination.

16. (Previously Presented) A process for the epoxidation of an olefin comprising the steps of: contacting a feed comprising an olefin and oxygen with a catalyst comprising a silver component deposited on a fluoride-mineralized carrier;

and producing a product mix comprising an olefin oxide, wherein the partial pressure of olefin oxide in the product mix is greater than about 60 kPa.

17. (Previously Presented) A process as claimed in claim 16, wherein the catalyst additionally comprises a high-selectivity dopant.

18. (Previously Presented) A process as claimed in claim 17, wherein the high-selectivity dopant comprises a rhenium component.

19. (Previously Presented) A process as claimed in claim 16, wherein the catalyst additionally comprises Group IA metal component.

20. (Previously Presented) A process as claimed in claim 16, wherein the carrier comprises alpha-alumina.

21. (Previously Presented) A process as claimed in claim 16, wherein the olefin comprises ethylene.

22. (Previously Presented) A process for the epoxidation of an olefin comprising the steps of: contacting a feed comprising an olefin and oxygen with a catalyst comprising a silver component and a high-selectivity dopant deposited on a fluoride-mineralized carrier; and producing a product mix comprising an olefin oxide, wherein the partial pressure of olefin oxide in the product mix is greater than about 20 kPa.

23. (Previously Presented) A process as claimed in claim 22, wherein the high-selectivity dopant comprises a rhenium component.

24. (Previously Presented) A process as claimed in claim 23, wherein the catalyst additionally comprises a rhenium co-promoter.

25. (Previously Presented) A process as claimed in claim 22, wherein the catalyst additionally comprises a Group IA metal component.

26. (Previously Presented) A process as claimed in claim 22, wherein the process employs a fixed bed, tubular reactor.

27. (Previously Presented) A process as claimed in claim 22, wherein the partial pressure of olefin oxide is greater than about 30 kPa.

28. (Previously Presented) A process as claimed in claim 22, wherein the partial pressure of olefin oxide is from about 40 kPa to about 60 kPa.

29. (Previously Presented) A process as claimed in claim 22, wherein the carrier comprises alpha-alumina.

30. (Previously Presented) A process as claimed in claim 22, wherein the olefin comprises ethylene.

31. (Previously Presented) A process for the epoxidation of an olefin comprising the steps of: contacting a feed comprising an olefin and oxygen with a catalyst comprising a silver component deposited on a carrier having a particulate matrix having a lamellar or platelet-type morphology; and producing a product mix comprising an olefin oxide, wherein the partial pressure of olefin oxide in the product mix is greater than about 60 kPa.

32. (Previously Presented) A process as claimed in claim 31, wherein the lamellar or platelet-type morphology is such that particles having in at least one direction a size greater than 0.1 micrometer have at least one substantially flat major surface.

33. (Previously Presented) A process for the epoxidation of an olefin comprising the steps of: contacting a feed comprising an olefin and oxygen with a catalyst comprising a silver component and a high-selectivity dopant deposited on a carrier having a particulate matrix having a lamellar or platelet-type morphology; and

producing a product mix comprising an olefin oxide, wherein the partial pressure of olefin oxide in the product mix is greater than about 20 kPa.

34. (Previously Presented) A process as claimed in claim 33, wherein the high selectivity dopant comprises a rhenium component and the catalyst additionally comprises a rhenium co-promoter.

35. (Previously Presented) A process as claimed in claim 33, wherein the lamellar or platelet-type morphology is such that particles having in at least one direction a size greater than 0.1 micrometer have at least one substantially flat major surface.

36. (Previously Presented) A process for the production of a 1,2-diol, a 1,2-diol ether or an alkanolamine comprising converting an olefin oxide into the 1,2-diol, the 1,2-diol ether or the alkanolamine wherein the olefin oxide has been obtained by a process for the epoxidation of an olefin as claimed in claim 16.

37. (Previously Presented) A process for the epoxidation of an olefin comprising the steps of: contacting a feed comprising an olefin and oxygen with a catalyst comprising a silver component deposited on an alpha-alumina carrier; and producing a product mix comprising an olefin oxide, wherein the partial pressure of olefin oxide in the product mix is from about 22 to 40 kPa, and wherein said alpha-alumina is prepared by a process comprising the step of contacting an alpha-alumina precursor with fluoride anions.

38. (Previously Presented) A process as claimed in claim 37, wherein said alpha-alumina is prepared by contacting an alpha-alumina precursor with fluoride anions followed by calcining the fluoride-contacted alpha-alumina precursor under conditions sufficient to form platelets of alpha-alumina.

39. (Previously Presented) A process as claimed in claim 37, wherein the catalyst additionally comprises a promoter selected from the group consisting of compounds of rhenium, molybdenum, tungsten, and an efficiency-enhancing salt of a member of a redox half-reaction pair comprising nitrate, nitrite, or other anions capable of forming nitrate anions under epoxidation conditions in the presence of a nitrogen-containing gaseous efficiency-enhancing member of a redox half-reaction pair.

40. (Previously Presented) A process as claimed in claim 39, wherein the promoter comprises a rhenium component.

41. (Previously Presented) A process as claimed in claim 37, wherein the catalyst additionally comprises a Group IA metal cation.

42. (Previously Presented) A process as claimed in claim 37, wherein said alpha-alumina carrier is prepared by a method comprising the steps of:

(a) selecting an alumina selected from the group consisting of boehmite alumina (AlOOH), gamma-alumina and mixtures thereof;

(b) peptizing the alumina of step (a) with a mixture containing an acidic component and fluoride anions to provide peptized fluorinated alumina;

(c) forming the peptized fluorinated alumina of step (b) to provide formed peptized fluorinated alumina;

(d) drying the formed peptized fluorinated alumina of step (c) to provide dried formed alumina; and

(e) calcining the dried formed alumina of step (d).

43. (Previously Presented) A process as claimed in claim 37, wherein the olefin comprises ethylene.

44. (Previously Presented) A process as claimed in claim 40, wherein the catalyst additionally comprises a rhenium co-promoter.

45. (Previously Presented) A process as claimed in claim 39, wherein the process employs a fixed bed, tubular reactor.

46. (Currently Amended) A process for the epoxidation of an olefin comprising the steps of: contacting a feed comprising an olefin and oxygen with a catalyst comprising a silver component deposited on an alpha-alumina carrier comprising particles each of which has at least one substantially major surface having a lamellate or platelet morphology; and producing a product mix comprising an olefin oxide, wherein the partial pressure of olefin oxide in the product mix is [[in]] from about 22 to 40 kPa.

47. (Previously Presented) A process as claimed in claim 46, wherein said alpha-alumina is prepared by contacting an alpha-alumina precursor with fluoride anions followed by calcining the fluoride-contacted alpha-alumina precursor under conditions sufficient to form platelets of alpha-alumina.

48. (Previously Presented) A process as claimed in claim 46, wherein said alpha-alumina carrier is prepared by a method comprising the steps of:

(a) selecting an alumina selected from the group consisting of boehmite alumina (AlOOH), gamma-alumina and mixtures thereof;

(b) peptizing the alumina of step (a) with a mixture containing an acidic component and fluoride anions to provide peptized fluorinated alumina;

(c) forming the peptized fluorinated alumina of step (b) to provide formed peptized fluorinated alumina;

(d) drying the formed peptized fluorinated alumina of step (c) to provide dried formed alumina; and

(e) calcining the dried formed alumina of step (d).

49. (Currently Amended) A process for the epoxidation of an olefin comprising the steps of: contacting a feed comprising an olefin and oxygen with a catalyst comprising a silver component and a promoter selected from the group consisting of compounds of rhenium, molybdenum, tungsten, and an efficiency-enhancing salt of a member of a redox half-reaction pair comprising nitrate, nitrite, or other anions capable of forming nitrate anions under epoxidation conditions in the presence of nitrogen-containing gaseous efficiency-enhancing member of a redox half-reaction pair deposited on an alpha-alumina carrier comprising particles each of which has at least one substantially major surface having a lamellate or platelet morphology; and producing a product mix comprising an olefin oxide, wherein the partial pressure of olefin oxide in the product mix is [[in]] from about 22 to 40 kPa.

50. (Previously Presented) A process as claimed in claim 49, wherein said alpha-alumina is prepared by contacting an alpha-alumina precursor with fluoride anions followed by calcining the fluoride-contacted alpha-alumina precursor under conditions sufficient to form platelets of alpha-alumina.

51. (Previously Presented) A process as claimed in claim 49, wherein said alpha-alumina carrier is prepared by a method comprising the steps of:

(a) selecting an alumina selected from the group consisting of boehmite alumina (AlOOH), gamma-alumina and mixtures thereof;

(b) peptizing the alumina of step (a) with a mixture containing an acidic component and fluoride anions to provide peptized fluorinated alumina;

(c) forming the peptized fluorinated alumina of step (b) to provide formed peptized fluorinated alumina;

(d) drying the formed peptized fluorinated alumina of step (c) to provide dried formed alumina; and

(e) calcining the dried formed alumina of step (d).

52. (Currently Amended) A process as claimed in claim 49, wherein the promoter comprises a rhenium component and the catalyst additionally comprises a rhenium co-promoter <u>selected from the group consisting of compounds of tungsten, molybdenum, sulfur and mixtures thereof</u>.

53. (New) A process for the epoxidation of an olefin comprising the steps of: contacting a feed comprising an olefin and oxygen with a catalyst comprising a silver component and a high-selectivity dopant deposited on a fluoride-mineralized carrier; and producing a product mix comprising an olefin oxide, wherein the concentration of carbon dioxide in the feed is less than about 2 mole-%, relative to the total feed.

54. (New) A process as claimed in claim 53, wherein the concentration of carbon dioxide in the feed is less that about 1 mole-%, relative to the total feed.

55. (New) A process as claimed in claim 53, wherein the concentration of carbon dioxide in the feed is less that about 0.75 mole-%, relative to the total feed.

56. (New) A process as claimed in claim 53, wherein the concentration of carbon dioxide in the feed is at least 0.1 mole-%, relative to the total feed.

57. (New) A process as claimed in claim 53, wherein the concentration of carbon dioxide in the feed is at least 0.3 mole-%, relative to the total feed.

58. (New) A process as claimed in claim 53, wherein the concentration of carbon dioxide in the feed is between about 0.50 mole-% and 0.75 mole-%, relative to the total feed.

59. (New) A process as claimed in claim 53, wherein the high-selectivity dopant comprises a rhenium component.

60. (New) A process as claimed in claim 59, wherein the catalyst additionally comprises a rhenium co-promoter.

61. (New) A process as claimed in claim 53, wherein the process employs a fixed bed, tubular reactor.

62. (New) A process as claimed in claim 53, wherein the carrier comprises alpha-alumina.

63. (New) A process as claimed in claim 53, wherein the olefin comprises ethylene.

64. (New) A process for the epoxidation of an olefin comprising the steps of: contacting a feed comprising an olefin and oxygen with a catalyst comprising a silver component and a rhenium component deposited on a fluoride-mineralized carrier; and producing a product mix comprising an olefin oxide, wherein the concentration of carbon dioxide in the feed is less than about 2 mole-%, relative to the total feed.

65. (New) A process as claimed in claim 64, wherein the concentration of carbon dioxide in the feed is less that about 1 mole-%, relative to the total feed.

66. (New) A process as claimed in claim 64, wherein the concentration of carbon dioxide in the feed is less that about 0.75 mole-%, relative to the total feed.

67. (New) A process as claimed in claim 64, wherein the concentration of carbon dioxide in the feed is at least 0.1 mole-%, relative to the total feed.

68. (New) A process as claimed in claim 64, wherein the concentration of carbon dioxide in the feed is at least 0.3 mole-%, relative to the total feed.

69. (New) A process as claimed in claim 64, wherein the concentration of carbon dioxide in the feed is between about 0.50 mole-% and 0.75 mole-%, relative to the total feed.

70. (New) A process as claimed in claim 64, wherein the catalyst additionally comprises a rhenium co-promoter.

71. (New) A process as claimed in claim 64, wherein the catalyst additionally comprises a Group IA metal component.

72. (New) A process as claimed in claim 64, wherein the carrier comprises alpha-alumina.

73. (New) A process as claimed in claim 64, wherein the olefin comprises ethylene.

74. (New) A process for the epoxidation of an olefin comprising the steps of: contacting a feed comprising an olefin and oxygen with a catalyst comprising a silver component and a high-selectivity dopant deposited on a carrier having a particulate matrix having a lamellar or platelet-type morphology; and producing a product mix comprising an olefin oxide, wherein the concentration of carbon dioxide in the feed is less than about 2 mole-%, relative to the total feed.

75. (New) A process as claimed in claim 74, wherein the lamellar or platelet-type morphology is such that particles having in at least one direction a size greater than 0.1 micrometer have at least one substantially flat major surface.

76. (New) A process for the production of a 1,2-diol, a 1,2-diol ether or an alkanolamine comprising converting an olefin oxide into the 1,2-diol, the 1,2-diol ether or the alkanolamine wherein the olefin oxide has been obtained by a process for the epoxidation of an olefin as claimed in claim 53.

77. (New) A process for the epoxidation of an olefin comprising the steps of: feeding a gas mixture comprising an olefin and oxygen to a reactor containing a catalyst comprising a silver component and a promoter selected from the group consisting of compounds of rhenium, molybdenum, tungsten, and an efficiency-enhancing salt of a member of a redox half-reaction pair comprising nitrate, nitrite, or other anions capable of forming nitrate anions under epoxidation conditions in the presence of a nitrogen-containing gaseous efficiency-enhancing member of a redox half-reaction pair deposited on an alpha-alumina carrier; and producing a product mix comprising an olefin oxide, wherein the concentration of carbon dioxide in the gas mixture contacting the catalyst is less than 3.0 mole-%, relative to the total feed, and wherein said alpha-alumina is prepared by a process comprising the step of contacting an alpha-alumina precursor with fluoride anions.

78. (New) A process as claimed in claim 77, wherein said alpha-alumina is prepared by contacting an alpha-alumina precursor with fluoride anions followed by calcining the fluoride-contacted alpha-alumina precursor under conditions sufficient to form platelets of alpha-alumina.

79. (New) A process as claimed in claim 77, wherein the concentration of carbon dioxide in the gas mixture contacting the catalyst is about 0.9 mole-% or less.

80. (New) A process as claimed in claim 77, wherein the concentration of carbon dioxide in the feed to the reactor is 0.0 mole-%, relative to the total feed to the reactor.

81. (New) A process as claimed in claim 80, wherein said process takes place in a back-mixed autoclave with internal gas recycle.

82. (New) A process as claimed in claim 81, wherein the concentration of carbon dioxide in the gas mixture contacting the catalyst is from about 0.7 to about 0.9 mole-%.

83. (New) A process as claimed in claim 79, wherein the promoter comprises a rhenium component.

84. (New) A process as claimed in claim 83, wherein the catalyst additionally comprises a rhenium co-promoter.

85. (New) A process as claimed in claim 79, wherein the catalyst additionally comprises an alkali metal component.

86. (New) A process as claimed in claim 77, wherein the process employs a fixed bed, tubular reactor.

87. (New) A process as claimed in claim 77, wherein said alpha-alumina carrier is prepared by a method comprising the steps of:

(a) selecting an alumina selected from the group consisting of boehmite alumina (AlOOH), gamma-alumina and mixtures thereof;

(b) peptizing the alumina of step (a) with a mixture containing an acidic component and fluoride anions to provide peptized fluorinated alumina;

(c) forming the peptized fluorinated alumina of step (b) to provide formed peptized fluorinated alumina;

(d) drying the formed peptized fluorinated alumina of step (c) to provide dried formed alumina; and

(e) calcining the dried formed alumina of step (d).

88. (New) A process as claimed in claim 79, wherein the olefin comprises ethylene.

89. (New) A process for the epoxidation of an olefin comprising the steps of: feeding a gas mixture comprising an olefin and oxygen to a reactor containing catalyst comprising a silver component and a rhenium component deposited on an alpha-alumina carrier; and producing a product mix comprising an olefin oxide, wherein the concentration of carbon dioxide in the gas mixture contacting the catalyst is less than 3.0 mole-%, and wherein said alpha-alumina is prepared by a process comprising the step of contacting an alpha-alumina precursor with fluoride anions.

90. (New) A process as claimed in claim 89, wherein said alpha-alumina is prepared by contacting an alpha-alumina precursor with fluoride anions followed by calcining the fluoride-contacted alpha-alumina precursor under conditions sufficient to form platelets of alpha-alumina.

91. (New) A process as claimed in claim 89, wherein the concentration of carbon dioxide in the gas mixture contacting the catalyst is about 0.9 mole-% or less.

92. (New) A process as claimed in claim 89, wherein the concentration of carbon dioxide in the feed to the reactor is 0.0 mole-%, relative to the total feed to the reactor.

93. (New) A process as claimed in claim 92, wherein said process takes place in a back-mixed autoclave with internal gas recycle.

94. (New) A process as claimed in claim 93, wherein the concentration of carbon dioxide in the gas mixture contacting the catalyst is from about 0.7 to about 0.9 mole-%.

95. (New) A process as claimed in claim 89, wherein the catalyst additionally comprises a rhenium co-promoter selected from the group consisting of compounds of tungsten, molybdenum, sulfur and mixtures thereof.

96. (New) A process as claimed in claim 89, wherein the catalyst additionally comprises an alkali metal component.

97. (New) A process as claimed in claim 91, wherein said alpha-alumina carrier is prepared by a method comprising the steps of:

(a) selecting an alumina selected from the group consisting of boehmite alumina (AlOOH), gamma-alumina and mixtures thereof;

(b) peptizing the alumina of step (a) with a mixture containing an acidic component and fluoride anions to provide peptized fluorinated alumina;

(c) forming the peptized fluorinated alumina of step (b) to provide formed peptized fluorinated alumina;

(d) drying the formed peptized fluorinated alumina of step (c) to provide dried formed alumina; and

(e) calcining the dried formed alumina of step (d).

98. (New) A process as claimed in claim 91, wherein the olefin comprises ethylene.

99. (New) A process for the epoxidation of an olefin comprising the steps of: feeding a gas mixture comprising an olefin and oxygen to a reactor containing a catalyst comprising a silver component and a promoter selected from the group consisting of compounds of rhenium, molybdenum, tungsten, and an efficiency-enhancing salt of a member of a redox half-reaction pair comprising nitrate, nitrite, or other anions capable of forming nitrate anions under epoxidation conditions in the presence of a nitrogen-containing gaseous efficiency-enhancing member of a redox half-reaction pair deposited on an alpha-alumina carrier comprising particles each of which has at least one substantially major surface having a lamellate or platelet morphology; and producing a product mix comprising an olefin oxide, wherein the concentration of carbon dioxide in the gas mixture contacting the catalyst is less than 3.0 mole-%.

100. (New) A process as claimed in claim 99, wherein said alpha-alumina is prepared by contacting an alpha-alumina precursor with fluoride anions followed by calcining the fluoride-contacted alpha-alumina precursor under conditions sufficient to form platelets of alpha-alumina.

101. (New) A process as claimed in claim 99, wherein the concentration of carbon dioxide in the gas mixture contacting the catalyst is about 0.9 mole-% or less.

102. (New) A process as claimed in claim 99, wherein the concentration of carbon dioxide in the feed to the reactor is 0.0 mole-%, relative to the total feed to the reactor.

103. (New) A process as claimed in claim 101, wherein said process takes place in a back-mixed autoclave with internal gas recycle.

104. (New) A process as claimed in claim 103, wherein the concentration of carbon dioxide in the gas mixture contacting the catalyst is from about 0.7 to about 0.9 mole-%.

105. (New) A process as claimed in claim 101, wherein said alpha-alumina carrier is prepared by a method comprising the steps of:

(a) selecting an alumina selected from the group consisting of boehmite alumina (AlOOH), gamma-alumina and mixtures thereof;

(b) peptizing the alumina of step (a) with a mixture containing an acidic component and fluoride anions to provide peptized fluorinated alumina;

(c) forming the peptized fluorinated alumina of step (b) to provide formed peptized fluorinated alumina;

(d) drying the formed peptized fluorinated alumina of step (c) to provide dried formed alumina; and

(e) calcining the dried formed alumina of step (d).